

Physics of Reconnection and MMS Mission.

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Reconnection is the most important process driving the Earth's magnetosphere. Key to the success of the MMS science plan is the coupling of theory and observation. Determining the kinetic processes occurring in the diffusion region and physical parameters that control the rate of magnetic reconnection are among primary objectives of the MMS mission. Analysis of the role played by particle inertial effects in the diffusion region where the plasma is unmagnetized will be presented. The reconnection electric field in the diffusion region is supported primarily by particle non-gyrotropic effects. At the quasi-steady stage the reconnection electric field serves to accelerate and heat the incoming plasma population to maintain the current flow in the diffusion region the pressure balance. The primary mechanism controlling the dissipation in the vicinity of the reconnection site is incorporated into the fluid description in terms of non-gyrotropic corrections to the induction and energy equations. The results of kinetic and fluid simulations illustrating the physics of magnetic reconnection will be presented. We will demonstrate that kinetic nongyrotropic effects can significantly alter the global magnetosphere evolution and location of reconnection sites.